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(54) Title: **SYSTEM AND METHOD FOR MANAGEMENT OF SPECIMENS**

(57) **Abstract:** A system and method for the management of specimens, and particularly for the management of cryogenically stored biological specimens. The management functions can be performed remotely via the Internet. Management functions include the establishment, dispatch, retrieval, delivery to third parties, disposal, etc., of the samples. Environmental factors of the cryogenic storage means can be controlled, and varying access may be authorised. Data pertaining to the samples may be logged for historical data, analysed, processed in report form, etc. The specimens may be biological specimens, or samples of plants, plant extracts, insects or other samples. The specimens may be stored in ambient, refrigerated, frozen, ultracold, cryogenic or other environmental conditions.

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SYSTEM AND METHOD FOR MANAGEMENT OF SPECIMENS

Technical Field

The present invention relates to a system and method for the management of specimens.

- 5 The system and method is particularly applicable, although not limited to, the management of cryogenically stored biological specimens, whereby management functions may be performed remotely via the Internet. The system may, for example, be used for the management of the specimens such as plants, plant extracts, insects, extracts of insects or other natural specimens, and, the storage of the specimens may be performed at ambient,
10 refrigerant, frozen (e.g. -20°C), ultracold (e.g. -80°C), or other temperatures and environmental conditions.

Background of the Invention

- The reference to any prior art in this specification is not, and should not be taken as, an
15 acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

- The storage time of biological specimens is known to be extended by cooling such specimens to "cryogenic" temperatures. Biological specimens stored using cryogenics
20 includes plasma, DNA, cell lines, and tissues. There are various approaches to cryo-preservation of biological specimens, each of which require the control of the storage condition parameters, such that a cryobiologist is able to bring the specimens to cryogenic temperatures and then return them to physiological conditions, without injury.

- 25 The storage of biological samples involves the collation of a large amount of data pertaining to each individual specimen. Each specimen must be categorised according to the type of specimen, the storage conditions required, the storage duration, etc. The management of data pertaining to cryogenically stored biological specimens is critical to optimise the probability of successfully storing the sample and being able to conveniently
30 access the sample when required, but has heretofore typically been recorded manually, possibly with the use of stand-alone PCs utilising Excel spreadsheets or Microsoft Access.

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The Internet has changed the fundamental aspects of the way scientists work in that it provides a unique forum for the dissemination and exchange of information. The Internet provides a forum whereby collective information can be exchanged at a rapid rate and whereby various systems can be remotely managed.

5

In a networked data communications system, users have access to terminals which are capable of requesting and receiving information from local or remote information sources. In such a system a terminal may be any type of computer or computerised device, a personal computer (PC), a mobile or cellular phone, a mobile data terminal, a portable
10 computer, a personal digital assistant (PDA), a pager, or any other similar type of electronic device. The capability of the terminal to request and/or receive information can be provided by an application program, hardware or other such entity. A terminal may be provided with associated devices, for example an information storage device such as a hard disk drive.

15

In such a system an information source may be a server or any other type of terminal (for example, a PC computer) coupled to an information storage device (for example, a hard disk drive). The exchange of information (i.e., the request and/or receipt of information) between the terminal and the information source, or other terminal(s), is facilitated by a
20 connection referred to as a communication channel. The communication channel can be physically realised via a metallic cable (for example, a telephone line), semi-conducting cable, an electromagnetic signal (for example, a radio frequency (RF) signal), an optical fibre cable, a microwave link, a satellite link or any other such medium or combination thereof connected to a network infrastructure.

25

The infrastructure may be a telephone switch, a base station, a bridge, a router, or any other such specialised component, which facilitates the connection between the terminal and the network. Collectively, the interconnected group of terminals, physical connections, infrastructure and information sources is referred to as a computer network or data
30 communications network.

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The computer network itself may take a variety of forms. It may be located within a local geographic area, such as an office building, and consist of only a limited number of terminals and information sources. This type of computer network is commonly referred to as a Local Area Network (LAN). On a broader scale, it may be larger and support more users over a wider geographic area, such as across a city. This type of network is commonly referred to as a Wide Area Network (WAN). On an even broader scale LAN and WAN networks may be interconnected across a country or globally. An example of a globally connected computer network is the Internet.

10 **Summary of the Invention**

In one broad form, the present invention provides a system for the management of specimens.

Preferably, the specimens are biological samples, but alternatively, the specimens may be plants, plant extracts, insects, or any other samples or specimens.

Preferably, said stored biological samples or other specimens are stored under cryogenic conditions.

Also preferably, however, the specimens may be stored in other environmental conditions, such as ambient, refrigerated, frozen, ultracold or other conditions.

Preferably, said stored biological samples or other specimens are managed remotely from storage means, via a computer network, such as the Internet.

25

Preferably, the management of said biological samples or other specimens includes the control of the environmental conditions at said storage means.

Preferably, said environmental conditions includes temperature, humidity, etc., of one or more freezer unit.

30

Preferably, said environmental conditions may be set or adjusted.

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Preferably, said system includes a profile database having profile data correlating to sample data of said biological samples or other specimens.

- 5 Preferably, said profile database is searchable for identification of predetermined parameters pertaining thereto.

Preferably, said profile database is searchable from a remote location, via a computer network, such as the Internet.

10

Preferably, the management of said system includes the instruction of setting up, retrieval, delivery to third parties, and/or, disposal of said biological samples or other specimens.

Preferably, the management of said system is controllable by one or more users.

15

Preferably, said system includes authentication means to authenticate the authority of said one or more users to manage said system.

- 20 Preferably, said authentication means includes the supply of a user name and password, the use of biometric (e.g. fingerprint or iris scan) identification means, and/or other authentication means.

Preferably, a user can access the management system from any type of terminal.

- 25 Preferably, varying levels of authentication means are enabled to different users, dependent upon individual access and management authorities.

Preferably, said system includes validation means for indication to a user of a management instruction.

30

Preferably, said validation means includes the supply of return data or some means of visual indication (such as the greying of a screen) being provided to the user.

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Preferably, said system includes logging means, to record ongoing data pertaining to each sample/specimen or groups of samples/specimen.

- 5 Preferably, historical data pertaining to said sample/specimen or groups of samples/specimens is retrievable from said logging means.

Preferably, said system further includes analysing means to analyse data pertaining to a sample/specimen or groups of samples/specimens, produce reports thereabouts, etc.

10

Preferably, said system uses one or more graphical interface.

Also preferably, said system includes replication and/or queuing means.

- 15 Preferably, said system is used for the management of biological samples or other specimens by academic and/or research institutions, pathology practices, clinical trial purposes, agricultural purposes, etc.

- 20 Preferably, the present invention provides that the system may utilise a computer network which be any network of two or more communicating computers or terminals including but not limited to, an internetwork, an intranetwork, a LAN, a WAN, or the Internet.

- 25 Preferably, in accordance with the present invention information or data is exchanged by means including but not limited to: metallic cables; semi-conducting cables; optical fibre cables; satellite links; electromagnetic waves; microwave links; exchanging of memory devices; or any other such medium or combination thereof connected to a network infrastructure.

- 30 In another preferred form of the invention there is provided a computer-readable medium of instructions for management of stored biological samples.

In yet another preferred form of the invention there is provided a method for the

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management of stored biological samples or other specimens.

In a further broad form, a system for the management of stored biological specimens, including:

5 a repository of biological specimens, each specimen having sample data pertaining thereto;

 a processor, including:

 a database containing profile data correlating to said sample data;

 searching means for one or more user to search said database; and

10 control means, for one or more user to control the management of said specimens, including the retrieval, delivery and disposal of each sample, and, the environmental conditions in which each sample is stored.

Preferably, said processor is accessed by said one or more user from a remote location,
15 such as via the Internet.

Also preferably, said processor includes authentication means to authenticate the authority of said one or more users, wherein each said one or more users may have differing authority levels.

20 Also preferably, said processor further includes identification means to determine the identity of each of said one or more users, wherein said identification means includes the supply of a user name and password, the use of biometric identification means, or other like identification means.

25 In yet a further broad form, the present invention provides a method for managing the storage of biological specimens, including the steps of:

 providing a repository of biological specimens, each specimen having been sampled to obtain sample data pertaining thereto;

30 entering profile data, correlating to said sample data of said biological specimens into a database;

 managing the identification retrieval, delivery and disposal of each sample, and, the

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environmental conditions in which each sample is stored via a control means by one or more user.

Preferably, said one or more user accesses said database and/or said control means from a
5 remote location via a communications carrier, such as via the Internet.

Also preferably, said managing step further includes authenticating the authority of said one or more user, wherein users may have a differing authority level.

10 Also preferably, said managing step further includes identifying said one or more user, including by the supply of a user name and password, the use of biometric identification means, or other like identification means.

In a further broad form, the present invention provides a computer readable medium of
15 instruction for the management of stored biological samples.

Detailed Description of Preferred Embodiments

The present invention will become more fully understood from the following detailed description of the preferred but non-limiting embodiments thereof.

20

The system and method of the present invention has been established to provide a secure, off-site, low-temperature storage facility for specimens such as plasma, DNA, cell lines, tissues and other biological specimens, for natural or artificial products, including plants, plant extracts, insects, etc. At a central storage facility, unique identifiers streamline
25 sample handling and processing, while the proprietary inventory management system stores all sample data and user defined information. Sample information can be securely accessed at any time via the Internet.

The inventory management system of the present invention permits persons to access
30 information about the samples at any time via the Internet. This management service stores all data associated with the sample including location, temperature records and all user-defined information. Individual persons or corporations are able to define and/or

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determine the security level of access required from username/password through to biometric identification (e.g. fingerprint or iris scan). The audit trail is able to determine the complete history of a sample including every movement within the facility, the time and duration of each opening of the storage vessel and who accessed the vessel.

5

Parties can use the system to access all information about all or a determined selection of the samples, request retrieval, delivery to third parties or disposal. Additionally, controls on who has access to the material, who can move, retrieve or dispose of samples can easily be established. Parties can select their own identification system for vials based on their

10 own requirements.

Parties are able to access the database via their web browser to store information about samples. They may store the information on their own premises or they can record sample information via the browser and request storage of the samples from a centralised facility.

15

Some of the individual modules that make up the software are:

Wizards used to configure protocols include the following:

- Freezer wizard
- 20 • Box wizard
- Vial wizard

User definable data types for fields to record data, include the following:

- Data (collection data, test data, storage data, processing data)
- 25 • Type (blood, serum, plasma, urine, semen, seeds)
- Storage conditions (ambient, refrigerant, frozen (e.g. -20°C), ultracold (e.g. -80°C), cryogenic, etc.)
- Storage duration, eg. Store until advised, specific date, time from receipt of samples.

30

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Users can process various on-line requests including the following:

- Add box and vial data
 - Request sample shipping to centralised location
 - Request return of samples to user or other party
 - 5 • Request disposal of samples
 - On-line monitoring of the environmental conditions of individual sample, such as temperature
 - Request archival report of environmental conditions
- 10 Searches on any data fields to select samples with defined characteristics include the following:
- Analysis of data
 - Produce reports based on database searches, hard copy or file.
- 15 Access to the system may be determined by the user. By setting up a hierarchy of access, the user can determine what level of access privileges they or their employees are assigned. A key user, for example, may be permitted full system access so that they can set up the system parameters, such as, freezer, box and vial configurations and then construct a storage protocol. A more junior member of staff may only be able to add samples and
- 20 information, whereas, another employee may be able to make database queries on all of the data in their department.

Once a storage protocol has been set up, the user can add sample data. All samples that are stored on the database are identified by a barcode number, or the like. The system can

25 accommodate all common barcode formats.

The first step is to record the storage box details, including the box barcode number. The vials are then added to the box. At this point, the system automatically allocates the next available storage position – the random placing of vials in a box is not permitted.

30

If the user wishes to ship the samples to a centralised storage facility, a request for

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shipping may be sent, via email. The centralised facility will then act on this request and arrange the appropriate shipping.

Upon receipt of the samples at the centralised storage facility, the box is assigned a storage
5 location by the system. By linking the box ID with the individual vial ID's, the system can report such information as environmental monitoring down to the individual vial level.

The described embodiment of the system and method of the present invention has been designed from the ground-up as a web based application. As such, the system provides
10 global access to the same data elements at the same time. There are no special configuration requirements, however, and the system may be supported on a variety of platforms, including Mac and PC Internet platforms. The other feature of web based systems is that the transaction security is based on known third party standards.

15 It will be appreciated that the present invention, rather than being around the object stored (vial), is based around the process. This means that in the present system, users define protocols for storage, and this then drives the other parts of the process. The application may typically impose regiments such as:

- You can't store this vial in this box (it's too big)
- 20 • You can't use this protocol (it belongs to someone else)
- The application will tell you where to store a vial (but can be overridden)

The system of the present invention may be implemented whereby it uses graphical representations of various aspects, such as the box, freezer, etc.

25

It will be understood that the system of the present invention uses a high level of audit control. There is a copy of every record ever made. Every time a box is moved the transaction is recorded and a copy kept. This will provide a complete audit trail.

30 As such, the system of the present invention will integrate environmental monitoring with storage records. For every record, the user will be able to see a temperature graph of the storage conditions.

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The system of the present invention is designed to be preferably used within an Internet framework. This includes the usual client side HTML web pages and extends to the replication of data between servers connected via the Internet.

5

When data is changed on one server, it is preferably replicated to at least one other server in the domain. This design is enabled by every business object being able to be called from the web server and also from the "router". The router is the software component of the system that receives (or sends) database updates between servers.

10

Every database table and all key allocation is handled within a common business object. These are configurable per installation.

15 Rather than writing the data in real time across the Internet the transactions are queued and held locally until they can be forwarded. This provides a measure of recovery in case of database server melt down.

20 The design of the system to include replication and queuing minimises the possibility that data will be lost in the event of a node failure. It also permits the continued operation of the system in the event of breakdown in communication between the various nodes. In the same way that samples are distributed over the system (on and off-site) data is also distributed.

25 The following table, labelled Table 1, provides a listing of various components of the system of the present invention, a description of same and of their functionality.

TABLE 1

Component	Description	Functionality
Freezer wizard	Client can select a freezer configuration from a list of freezers or input user defined configuration	Clients define the arrangement of the shelves/racks and boxes in the freezer. The application is then able to calculate the number of storage units (eg boxes) that the freezer can store. It is also the basis from which capacity data is calculated.
Box wizard	Allows client to define the dimensions of the storage unit and the number of vials that can be stored	The box is treated as a matrix with alpha characters used to label the X axis and numeric characters to label the Y axis. Eg for a 100 place box, the matrix would be A-J, I-10.
Vial wizard	Client can define the dimensions of the storage vial	Data that can be defined is, height, diameter, volume, internal or external thread.
Vial storage allocation	Automatic allocation of vial	After a box has been defined and a number assigned using a barcode, the client can commence storing vials. The application automatically assigns the next available vial location.
Hierarchy of storage requirements	Permits the user to define a hierarchy of storage requirements.	The application directs the placement of items for storage. This permits users and management to develop a hierarchy of "placement directives" in relation to incoming samples. Eg. A new box to be stored in the facility will be automatically assigned a place near to existing samples from the same client. Or conversely will be stored in a separate freezer from all existing material.
Adding sample data	Allows input of data about the sample	Clients can input data attached to the sample. This data is stored on the Cryosite database server. The individual samples are identified by a barcode number, the system records and tracks movement of the sample through the system by this unique number.
Box storage location	Automatic allocation of box storage position	System automatically assigns a box storage location in the nominated storage location
Environmental monitoring	On-line monitoring of freezer temperature	Client is able to view current temperature of the freezer in which any individual samples is stored. Can also request report on historical records
Database searches	Dynamically configurable searches	Clients can search on user-defined categories and alter these dynamically. The results obtained presented as a hard copy report or as a file (Word or Excel)

TABLE 1 cont.

Integration	The storage management component integrates with all of the other supporting systems	Included are the courier system, finance system, monitoring systems, security systems.
Sample audits	Client can enquire on their samples	Whether samples are stored on-site or off-site, clients can produce a complete list of samples that have been registered on the database. Depending on the access levels
Security	A high security module provides protection against physical and electronic tampering	Physical security. All freezers have been modified by the addition of proximity readers to control and monitor access. Data security – 128 bit encryption, Virtual Private Network, Encrypted data storage Security is also implemented by administrative users selecting a level of "time-out", whereby users are logged out of the system after a defined period of inactivity.
User configuration	Users can configure their own storage protocols	This set-up allows users to define both physical attributes of the equipment, such as, box dimensions, and information attributes, (eg. sample type, test result)
WAP Support	Management is able to use a WAP based interface to receive system alerts.	This permits the use of portable WAP enabled devices to be used to receive system alerts.
Courier Interface	Permits the user to track the movement of samples that are in transit.	This permits the user to track the progress of shipments to and from the central facility by having the application interface with the tracking software of the courier company.
Integration with handheld devices.	Permits direct inventory updating.	The user will be able to use wireless handheld devices to interrogate the database and track inventory movements in real-time.
Biometric authentication	Users can require biometric authentication	The user will be able to require that biometric (or other) identification is needed before certain processes can be authorised. Eg. The destruction of samples.
User zones	Different zones for different user groups	The administrative function can define user "zones" that permit access to information within the database. This is used on an institution wide basis to share varying amounts of information between user groups.
Store/Recall function	Permits the user to ship/recall samples from an off-site facility	The user will be able to designate samples (usually in conjunction with the search function) to be shipped to or from an off-site storage facility.

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The following table, labelled Table 2, lists various layers of a preferred embodiment of a system of the present invention, the main layers being the user, business and database layers.

TABLE 2

5	Class Name bBox	Class Type Method Name Update Insert Read FLBProtocol FLBFreezer Recall FLBActive Store ReadBlank	Business Layer
10			
15	Class Name bBoxList	Class Type Method Name Search FLBProtocol	Business Layer
20			
25	Class Name bBoxType	Class Type Method Name Insert Read Search Update ReadBlank	Business Layer
30	Class Name bControl	Class Type Method Name ReadControl UpdateControl FLBConMand ListControls FLBActive	Business Layer
35			
40	Class Name bdatatype	Class Type Method Name Read ReadBlank Update Insert	Business Layer
45	Class Name bDataTypeList	Class Type Method Name Search	Business Layer

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5	Class Name bEntity	Class Type Method Name Read Update Insert ReadBlank	Business Layer
10	Class Name BEntityList	Class Type Method Name Search	Business Layer
15 20	Class Name bEntityListBoxes	Class Type Method Name FLBEntityType FLBEntityStatus FLBBankName FLBSellerStatus FLBCollectMethod FLBAcctType FLBBuyerStatus FLBCreditBand FLBPayMethod	Business Layer
25 30	Class Name bFreezer	Class Type Method Name Read Update Insert FillListBoxCustomer Delete FillListBoxSite ReadBlank FillListBoxFreezer	Business Layer
35	Class Name bFrelist	Class Type Method Name Search	Business Layer
40 45	Class Name bLocation	Class Type Method Name FLBLocationStatus Update FLBLocationType FLBLocationCountry FLBLocationState FLBProVilType Read Insert ReadBlank	Business Layer
50	Class Name bLocationList	Class Type Method Name	Business Layer

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		Search FLBLocationType	
	Class Name	Class Type	Business Layer
5	bPerson	Method Name Read Search FLBPersonActive FLBPersonTitle FLBPersonType Update ReadBlank DelRoleRow FLBRoleList Insert RoleInsert	
10			
	Class Name	Class Type	Business Layer
20	bProtocol	Method Name Read FLBProBxtType FLBProTrlType FLBProStorLen Update ReadBlank FLBProSamType FLBProVilType FLBProFreType FLBProSamFateType Insert FLBProSite FLBConDatatype	
25			
	Class Name	Class Type	Business Layer
35	bProtocolList	Method Name Search	
	Class Name	Class Type	Business Layer
40	bProtocolManual	Method Name ReadMan ReadBlankMan UpdateMan InsertMan ReadVial	
45			
	Class Name	Class Type	Business Layer
	bRole	Method Name Read	
50	Class Name	Class Type	Business Layer
	bSeller	Method Name ReadTrans	

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	Class Name bVial	Class Type Method Name ReadVial Update Insert ReadBlank	Business Layer
5			
	Class Name bVialList	Class Type Method Name Search FLBVilProt	Business Layer
10			
	Class Name bVialType	Class Type Method Name FLBVialMat Read Update Insert Search ReadBlank	Business Layer
15			
20			
	Class Name uBox	Class Type Method Name box edit	User Layer
25			
	Class Name uBoxList	Class Type Method Name box search	User Layer
30			
	Class Name uBoxType	Class Type Method Name box type edit	User Layer
35			
	Class Name uBoxTypeList	Class Type Method Name box type search	User Layer
40			
	Class Name uCapacityDetail	Class Type Method Name CapacityDetail	User Layer
45			
	Class Name uCapacitySearch	Class Type Method Name capacity search	User Layer
50			
	Class Name uControl	Class Type Method Name control search ControlEdit	User Layer
	Class Name	Class Type	User Layer

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	uDatatype	Method Name DataType View/Edit	
5	Class Name uDataTypeList	Class Type Method Name Data Type Search	User Layer
10	Class Name uEntity	Class Type Method Name entity view/edit	User Layer
15	Class Name uEntityList	Class Type Method Name entity search	User Layer
20	Class Name ufreezer	Class Type Method Name Freezer View/Edit	User Layer
25	Class Name ufreList	Class Type Method Name freezer search	User Layer
30	Class Name UGenericScreens	Class Type Method Name Generic Search Generic View/Edit	User Layer
35	Class Name uLocation	Class Type Method Name location view/edit	User Layer
40	Class Name uLocationList	Class Type Method Name location search	User Layer
45	Class Name uPerson	Class Type Method Name person view/edit	User Layer
50	Class Name uPersonList	Class Type Method Name person search	User Layer
	Class Name uProtocol	Class Type Method Name protocol edit	User Layer
	Class Name uProtocolList	Class Type Method Name ProtocolSearch	User Layer

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	Class Name uRole	Class Type Method Name RoleList	User Layer
5	Class Name uRoleList	Class Type Method Name Role List	User Layer
10	Class Name uVial	Class Type Method Name ProtocolManViewEdit vial view/edit	User Layer
15	Class Name uVialList	Class Type Method Name vial search	User Layer
20	Class Name uVialType	Class Type Method Name vialtype view/edit	User Layer
25	Class Name uVialTypeList	Class Type Method Name vialtype search	User Layer
30	Class Name uWelcome	Class Type Method Name home	User Layer
35	Class Name bBox	Class Type Property Name box_active smp_id box_entkey box_name box_id box_cstid box_height box_width box_depth box_comments smp_name bxt_name box_prtkey box_prot box_key bxt_xstart bxt_xlength smp_cstid bxt_ystart	Business Layer Description Description Description Description Description Description Description Description Description Description Description Description Description Description Description Description Description Description
40			
45			
50			

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		bxt_ylength	Description
		box_frepos	Description
		box_rckpos	Description
		box_shlpos	Description
5		bop_x	Description
		bop_y	Description
		smp_key	Description
		box_frekey	Description
		box_rcpkey	Description
10			
	Class Name	Class Name	Class Type
	bBoxList		Property Name
		box_cstkey	Description
		box_loc	Description
15		box_name	Description
		box_id	Description
		box_cstid	Description
		box_lastupdwhen	Date
		box_bxtkey	Description
20		prt_name	Description
		box_key	Description
		in_box_id	Description
		in_box_cstid	Description
		in_box_prot	Firstname
25			
	Class Name	Class Name	Class Type
	bBoxType		Property Name
		bxt_key	Description
		bxt_type	Description
30		bxt_xlength	Description
		bxt_ylength	Description
		bxt_width	Description
		bxt_comments	Description
		bxt_lastupdwhen	Date
35		bxt_name	Description
		bxt_active	Description
		bxt_xstart	Description
		bxt_ystart	Description
		bxt_height	Description
40		bxt_depth	Description
		bxt_lastupdby	Description
		bxt_lastupdaction	Description
		in_bxttype	Description
45			
	Class Name	Class Name	Class Type
	bControl		Property Name
		prt_key	Description
		prt_name	Description
		ct2_text	Description
50		prt_key	Description
		ct2_type	Description
		ct2_key	Description

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		ct2_top	Description
		ct2_visible	Description
		ct2_name	Description
5		ct2_valuereqd	Description
		ct2_tabnum	Description
		ct2_left	Description
		ct2_width	Description
		ct2_height	Description
10		ct2_tabstop	Description
		ct2_tabindex	Description
		ct2_prkey	Description
		ct2_visible	Description
		ct2_lastupdby	Description
15		ct2_lastupdwhen	Date
	Class NameClass Name	Class Type	Business Layer
	bdatatype	Property Name	
		dat_key	Description
20		dat_lastupdwhen	Date
		dat_name	Description
		dat_lastupdby	Description
	Class NameClass Name	Class Type	Business Layer
25	bDataTypelist	Property Name	
		dat_key	Description
		in_name	Description
		dat_name	Description
30	Class NameClass Name	Class Type	Business Layer
	bEntity	Property Name	
		ent_rg_psnkey	Description
		ent_hl_psnkey	Description
		ent_defdel_location	Description
35		ent_hl_psnname	Description
		ent_key	Integer
		ent_abn	Description
		in_key	Description
		ent_website	Description
40		ent_acn	Description
		ent_id	Description
		ent_trade_name	Description
		ent_admin_lockkey	Integer
		ent_defdel_lockkey	Integer
45		ent_reg_name	Description
		ent_admin_location	Description
		ent_rg_psnname	Description
		ent_since	Date
		ent_lastupdby	Description
		ent_lastupdwhen	Date
50		ent_lastupdaction	Description
		ent_active	Description

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	Class Name BEntityList	Class Type Property Name in_name in_id ent_key ent_reg_name ent_id	Business Layer Description Description Description Description Description
5			
10	Class Name bFreezer	Class Type Property Name FRE_FREXSTART FRE_ID FRE_NAME FRE_MAXTEMP FRE_POLFREQ FRE_FREXLEN IN_KEY FRE_FREYSTART FRE_COMMENT FRE_KEY FRE_MINTEMP FRE_TYPE FRE_LASTUPDWHEN FRE_FREYLEN FRE_SHLXSTART FRE_SHLYSTART FRE_RCKXSTART FRE_CSTKEY FRE_SITKEY FRE_RCKYSTART FRE_NOSHELVES FRE_NOLOC FRE_SHLXLEN FRE_SHLYLEN FRE_RCKXLEN FRE_RCKYLEN	Business Layer Description Description Description Description Integer Integer Integer Description Description Integer Description Description Date Integer Description Description Description Integer Integer Integer Integer Integer Integer Integer Integer
15			
20			
25			
30			
35			
40	Class Name bFrelist	Class Type Property Name fre_name fre_noshelves in_freid in_frename fre_key fre_id	Business Layer Description Integer Description Description Integer Description
45			
50	Class Name bLocation	Class Type Property Name loc_entkey loc_status loc_name loc_add1	Business Layer Description Description Description Description

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	loc_add3	Description
	loc_state	Description
	loc_pcode	Postcode
5	loc_key	Description
	loc_type	Description
	loc_shortname	Description
	loc_add2	Description
	loc_city	Description
	loc_country	Description
10	loc_phone	Description
	loc_fax	Phone No
	loc_notes	Description
	loc_lastupdwhen	Date
15	in_key	Integer
	loc_lastupdby	Description
	loc_lastupdaction	Description
	loc_add4	Description
	loc_entname	Description
	loc_ean	Description
20	Class NameClass Name	Class Type
	bLocationList	Property Name
	in_name	Description
	in_shortname	Description
25	in_type	Description
	loc_shortname	Description
	loc_entname	Description
	loc_name	Description
	loc_type	Description
30	loc_status	Description
	loc_key	Description
	loc_entkey	Description
	loc_add1	Description
	loc_add2	Description
35	loc_add3	Description
	loc_add4	Description
	loc_city	Description
	loc_country	Description
	loc_fax	Description
40	loc_lastupdaction	Description
	loc_lastupdby	Description
	loc_lastupdwhen	Description
	loc_notes	Description
	loc_pcode	Description
45	loc_phone	Description
	loc_state	Description
	loc_ean	Description
50	Class NameClass Name	Class Type
	bPerson	Property Name
	ent_reg_name	Description
	psn_wkfax	Description

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		psn_hmemail	Description
		psn_password	Description
		psn_initcalkey	Description
5		psn_familyname	Description
		psn_lastupdby	Description
		psn_lastupdwhen	Date
		psn_lastupdaction	Description
		psn_givename	Description
		psn_dob	DOB
10		in_familyname	Firstname
		in_givename	Firstname
		in_dob	DOB
		psn_name	Date
		psn_wkphone	Phone No
15		psn_hmfax	Phone No
		psn_wkemail	Description
		psn_type	Description
		psn_status	Description
		psn_key	Integer
20		psn_title	Description
		psn_namesuffix	Description
		per_key	Description
		zTab4ent_key	Description
		zTab4rol_key	Description
25		pre_key	Description
		psn_active	Description
		psn_maidenname	Description
		psn_prefername	Description
		psn_hmphone	Description
30		psn_username	Description
		psn_desc	Description
		psn_notes	Description
		rol_name	Description
35	Class NameClass Name	Class Type	Business Layer
	bProtocol	Property Name	
		prt_name	Description
		prt_frekey	Description
40		prt_bxtkey	Description
		prt_smpfate	Description
		prt_trlkey	Description
		prt_message	Description
		prt_lastupdwhen	Date
45		prt_temp	Description
		prt_vilkey	Description
		prt_storlen	Description
		prt_smptype	Description
		prt_key	Description
50		prt_lastupdby	Description
		prt_sitkey	Description
	Class NameClass Name	Class Type	Business Layer

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	bProtocolList	Property Name	Description
5		prt_key	Description
		prt_temp	Description
		vil_type	Description
		prt_name	Description
		bxt_type	Description
		in_proname	Description
	Class NameClass Name	Class Type	Business Layer
10	bProtocolManual	Property Name	
15		smp_date2	DOB
		smp_text3	Description
		prt_message	Description
		smp_date1	DOB
		smp_date3	DOB
		smp_date4	DOB
20		smp_date5	DOB
		smp_date6	DOB
		smp_date7	DOB
		smp_date8	DOB
		smp_date9	DOB
		smp_date10	DOB
25		smp_time1	Description
		smp_time2	Description
		smp_time3	Description
		smp_time4	Description
		smp_time5	Description
		smp_time6	Description
30		smp_time7	Description
		smp_time8	Description
		smp_time9	Description
		smp_time10	Description
		smp_text1	Description
		smp_text2	Description
35		prt_name	Description
		vil_type	Description
		bxt_type	Description
		trl_name	Description
		prt_frekey	Description
		prt_smptype	Description
40		prt_smpfate	Description
		prt_stortype	Description
		prt_storlen	Description
		prt_temp	Description
		smp_key	Description
		smp_text4	Description
45		smp_text5	Description
		smp_text6	Description
		smp_text7	Description
		smp_text8	Description
		smp_text9	Description
		smp_text10	Description
50			

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		smp_numerical1	Description
		smp_numerical2	Description
		smp_numerical3	Description
		smp_numerical4	Description
5		smp_numerical5	Description
		smp_numerical6	Description
		smp_numerical7	Description
		smp_numerical8	Description
		smp_numerical9	Description
10		smp_numerical10	Description
		smp_id	Description
		smp_cstid	Description
		prt_key	Description
		smp_prtkey	Description
15		smp_name	Description
	Class Name	Class Name	Class Type
	bRole		Property Name
			Business Layer
		rol_active	Code
20		rol_lastupdby	Description
		rol_lastupdaction	Description
		rol_key	Primary Key
		rol_name	Description
		rol_lastupdwhen	Description
25	Class Name	Class Name	Class Type
	bSeller		Property Name
			Business Layer
		ent_sel_dispute_val	Description
		ent_reg_name	Description
30		trn_goodsdesc	Description
		trn_status	Description
		ent_key	Description
		trn_tran_date	Description
		trn_selref	Description
35		trn_seltotal	Description
		ent_sel_debt	Description
		trn_buy_reg_name	Description
	Class Name	Class Name	Class Type
40	bvial		Property Name
			Business Layer
		smp_date2	DOB
		smp_text3	Description
		prt_message	Description
45		smp_date1	DOB
		smp_date3	DOB
		smp_date4	DOB
		smp_date5	DOB
		smp_date6	DOB
		smp_date7	DOB
50		smp_date8	DOB
		smp_date9	DOB
		smp_date10	DOB

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	smp_time1	Description
	smp_time2	Description
	smp_time3	Description
5	smp_time4	Description
	smp_time5	Description
	smp_time6	Description
	smp_time7	Description
	smp_time8	Description
	smp_time9	Description
10	smp_time10	Description
	smp_text1	Description
	smp_text2	Description
	prt_name	Description
	vil_type	Description
15	bxt_type	Description
	trl_name	Description
	prt_frekey	Description
	prt_smptype	Description
	prt_smpfate	Description
20	prt_stortype	Description
	prt_storlen	Description
	prt_temp	Description
	smp_key	Description
25	smp_text4	Description
	smp_text5	Description
	smp_text6	Description
	smp_text7	Description
	smp_text8	Description
	smp_text9	Description
30	smp_text10	Description
	smp_numerical1	Description
	smp_numerical2	Description
	smp_numerical3	Description
	smp_numerical4	Description
35	smp_numerical5	Description
	smp_numerical6	Description
	smp_numerical7	Description
	smp_numerical8	Description
	smp_numerical9	Description
40	smp_numerical10	Description
	smp_id	Description
	smp_cstid	Description
	prt_key	Description
	smp_prtkey	Description
45	smp_name	Description
	smp_lastupdwhen	Description
	bop_x	Description
	bop_y	Description
	box_key	Description
50	smp_lastupdby	Description
	smp_lastupdaction	Description

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	Class Name	Class Name	Class Type	Business Layer
	bVialList		Property Name	
5			prt_key	Description
			smp_key	Description
			smp_cstid	Description
			smp_id	Description
			smp_name	Description
10			smp_desc	Description
			smp_loc	Description
			smp_freezer	Description
			trl_name	Description
			in_smpid	Description
15			in_SmpestId	Description
			in_boxid	Description
			in_Protocol	Description
	Class Name	Class Name	Class Type	Business Layer
	bVialType		Property Name	
20			ent_reg_name	Description
			in_vialtype	Description
			vil_entkey	Description
			vil_height	Description
			vil_key	Primary Key
25			vil_lastupdaction	Description
			vil_lastupdby	Description
			vil_lastupdwhen	Date
			vil_material	Description
			vil_name	Description
30			vil_outdia	Description
			vil_type	Description
			vil_volume	Description
	Class Name	Class Name	Class Type	User Layer
	uBox		Property Name	
35			box_active	Description
			smp_id	Description
			box_entkey	Description
			box_trlkey	Description
			box_name	Description
40			box_id	Description
			box_cstid	Description
			box_height	Description
			box_width	Description
			box_depth	Description
45			box_comments	Description
			smp_name	Description
			bxt_name	Description
			box_prtkey	Description
			box_prot	Description
50			box_key	Description
			bxt_xstart	Description
			bxt_xlength	Description

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		box_frekey	Description
		box_rcpkey	Description
		box_rckpos	Description
		box_shlpos	Description
5		box_frepos	Description
		bop_x	Description
		bop_y	Description
		VialKey	Description
		smp_key	Description
10		smp_cstid	Description
		bxt_type	Description
		bxt_ystart	Description
		bxt_ylength	Description
15	Class NameClass Name	Class Type	User Layer
	uBoxList	Property Name	
		in_id	Description
		in_protocol	Description
		BoxCustid	Description
20		Box_Protocol	Description
		Box_lastupdby	Description
		Box_lastupdaction	Description
		Box_key	Description
		in_cstid	Description
25		Box_id	Description
		BoxName	Description
		box_location	Description
		Box_lastupdwhen	Description
30	Class NameClass Name	Class Type	User Layer
	uBoxType	Property Name	
		Active	Description
		BxtName	Description
		Depth	Description
35		Lastupdaction	Description
		Lastupdwhen	Date
		Width	Description
		Xstart	Description
		Ystart	Description
40		BxtKey	Description
		Comments	Description
		Height	Description
		Lastupdby	Description
		Type	Description
45		Xlength	Description
		Ylength	Description
	Class NameClass Name	Class Type	User Layer
	uBoxTypeList	Property Name	
50		Lastupdwhen	Date
		Type	Description
		Width	Description

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		xLength	Description
		Xstart	Description
		Lastupdb	Description
5		Active	Description
		Ystart	Description
		BxtName	Description
		Height	Description
		in_Type	Description
10		Comments	Description
		Lastupdaction	Description
		Depth	Description
		BoxTypeKey	Description
		YLength	Description
15	Class NameClass Name	Class Type	User Layer
	uCapacityDetail	Property Name	
		bxt_freezer	Description
		col_NoofBoxes	Integer
		col_%full	Integer
20		col_shelf	Description
		col_totalnoofboxes	Integer
		col_key	Integer
25	Class NameClass Name	Class Type	User Layer
	uCapacitySearch	Property Name	
		bxt_site_name	Description
		col_%full	Integer
		col_freezer	Description
30		col_site_name	Description
		col_customer	Description
		col_key	Integer
35	Class NameClass Name	Class Type	User Layer
	uControl	Property Name	
		prt_key	Description
		ct2_visible	Description
		ct2_lastupdb	Description
		KeyRead	Description
		Text	Description
40		ProtocolNames	Description
		Mandatory	Description
		Top	Description
		Height	Description
45		TabIndex	Description
		ControlName	Description
		Keyct2read	Description
		Datatype	Description
		TabOrder	Description
		Left	Description
50		Width	Description
		ct2_lastupdwhen	Date

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		EntRegName	Description
		Status	Description
		LocName	Description
5		Address1	Description
		Address3	Description
		State	Description
		Country	Description
		LocNotes	Description
10		LastUpdBy	Description
		LastUpdWhen	Date
		LastUpdAction	Description
		Address4	Description
15	Class NameClass Name uLocationList	Class Type Property Name	User Layer
		scEntKey	Description
		scType	Description
		scShortName	Description
20		locEntKey	Description
		locEAN	Description
		locType	Description
		locShortName	Description
		locPhone	Description
25		locFax	Description
		scName	Description
		locKey	Description
		locEntRegName	Description
		locStatus	Description
30		locName	Description
		locAddress1	Description
		locAddress2	Description
		locAddress3	Description
		locAddress4	Description
35	Class NameClass Name uPerson	Class Type Property Name	User Layer
		InitialCallKey	Description
		PersonType	Description
40		PsnKey	Description
		PersonTitle	Description
		GivenName	Description
		PreferredName	Description
		MothersName	Description
45		WorkFax	Description
		HomePhone	Description
		HomeEmail	Description
		Active	Description
		FamilyName	Description
		NameSuffix	Description
50		DOB	DOB
		WorkPhone	Description
		WorkEmail	Description

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		HomeFax	Description
		FormedName	Description
		RoleKey	Description
		RoleName	Description
5		UserName	Description
		Password	Description
		LastUpdBy	Description
		LastUpdWhen	Date
		LastUpdAction	Description
10		Description	Description
		Notes	Description
		RoleEntity	Description
		PerKey	Description
		Status	Description
15		zTab4EntKey	Description
		zTab4RoleKey	Description
		PreKey	Description
	Class Name	Class Type	User Layer
20	uPersonList	Property Name	
		scFamilyName	Description
		scDOB	DOB
		vlStatus	Description
25		vlWorkPhone	Description
		vlFormedName	Description
		vlWorkEmail	Description
		scGivenName	Description
		vlWorkFax	Description
		vlPsnKey	Primary Key
30		vlDOB	Date
	Class Name	Class Type	User Layer
	uProtocol	Property Name	
35		BoxType	Description
		SampleFate	Description
		TrialName	Description
		Message	Description
		Location	Description
		Name	Description
40		prt_lastupdby	Description
		prt_trlkey	Description
		prt_sitkey	Description
		VialType	Description
		prt_temp	Description
45		StorageLen	Description
		SampleType	Description
		Time	Date
		prt_key	ItemNo
		prt_lastupdwhen	Date
50	Class Name	Class Type	User Layer
	uProtocolList	Property Name	

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	scName	Description
	vlType	Description
	vlStorageTemp	Description
	vlName	Description
5	vlBoxType	Description
	vlKey	Description
	Class Name Class Name uRole	Class Type Property Name User Layer
10	rol_active	Code
	rol_lastupdbby	Description
	rol_lastupdaction	Description
	rol_key	Primary Key
	rol_name	Description
15	rol_lastupdwhen	Description
	Class Name Class Name uRoleList	Class Type Property Name User Layer
20	scEntityName	Description
	scPersonName	Description
	Class Name Class Name uVial	Class Type Property Name User Layer
25	ProtocolName	Description
	Barcode	Description
	KeyRead	Description
	BoxType	Description
	Samplefate	Description
	TrialName	Description
30	Message	Description
	Location	Description
	Date2	Date
	Date4	Date
	Date6	Date
35	Date8	Date
	Date10	Date
	Time2	Description
	Time4	Description
	Time6	Description
40	Time8	Description
	Time10	Description
	Text2	Description
	Text4	Description
	Time5	Description
45	Text7	Description
	Text9	Description
	Numerical1	Integer
	CustID	Description
	Lastupdbby	Description
50	Lastupdaction	Description
	PosX	Description
	PosY	Description

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		BoxKey	Description
		VialType	Description
		StorageTemp	Description
		StorageLen	Description
5		SampleType	Description
		Time	Description
		Date1	Date
		Date3	Date
		Date5	Date
10		Date7	Date
		Date9	Date
		Time1	Description
		Time3	Description
		Time7	Description
15		Time9	Description
		Text1	Description
		Text3	Description
		Text5	Description
		Text6	Description
20		Text8	Description
		Text10	Description
		Numerical2	Integer
		Numerical3	Integer
		Numerical4	Integer
25		Numerical5	Integer
		Numerical6	Integer
		Numerical7	Integer
		Numerical8	Integer
		Numerical9	Integer
30		Numerical10	Integer
		Lastupdwhen	Description
		Samplename	Description
		KeyPro	Description
35	Class NameClass Name	Class Type	User Layer
	uVialList	Property Name	
		Prt_Key	Description
		scProtocol	Description
		BoxKey	Description
40		scClientID	Description
		scVialbarcode	Description
		scSmpName	Description
		sctrlName	Description
		Barcode	Description
45		ClientCode	Description
		VialFreezer	Description
		VialDesc	Description
		TrialName	Description
		BoxId	Description
50		VialKey	Description
		VialLoc	Description

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	Class Name		Class Type	User Layer
	uVialType		Property Name	
5			EntName	Description
			VilKey	Primary Key
			Lastupdb	Description
			Material	Description
			OutDiameter	Description
10			Type	Description
			EntKey	Description
			Height	Description
			Lastupdaction	Description
			Lastupdwhen	Description
15			Name	Description
			Volume	Description
	Class Name		Class Type	User Layer
	uVialTypeList		Property Name	
20			in_VialType	Description
			Lastupdaction	Description
			Lastupdb	Description
			Lastupdwhen	Date
			Name	Description
25			OutDiameter	Description
			Volume	Description
			VialType	Description
			Height	Description
			Key	Primary Key

The present invention has been hereinbefore described with reference to a specific
embodiment. It will be appreciated by persons skilled in the art that numerous variations
and modifications to the specific embodiment may be made. All such variations and
modifications should be considered to fall within the scope of the invention as broadly
hereinbefore described and as hereinafter claimed.

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THE CLAIMS :

1. A system for the management of stored specimens.
- 5 2. A system as claimed in claim 1, wherein said specimens are biological samples, plant extracts, insects, or other like specimens.
3. A system as claimed in claim 1, wherein said stored biological samples are stored under ambient, refrigerated, frozen, ultracold, cryogenic, or other environmental
10 conditions.
4. A system as claimed in any one of claims 1 to 3, wherein said stored biological samples or other specimens are managed remotely from storage means, via a communications carrier, such as the Internet.
15
5. A system as claimed in any one of claims 1 to 4, wherein the management of said biological samples or other specimens includes the control of the environmental conditions at said storage means.
- 20 6. A system as claimed in claim 5, wherein said environmental conditions includes temperature, humidity, etc., of one or more freezer unit.
7. A system as claimed in any one of claims 1 to 6, wherein said environmental conditions may be set or adjusted.
25
8. A system as claimed in any one of claims 1 to 7, said system including:
a profile database having profile data correlating to sample data of said biological samples or other specimens.
- 30 9. A system as claimed in claim 8, wherein said profile database is searchable for identification of predetermined parameters pertaining thereto.

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10. A system as claimed in claim 9, wherein said profile database is searchable from a remote location, via a communications carrier, such as the Internet.

11. A system as claimed in any one of claims 8 to 10, wherein the management of said
5 system includes the instruction of setting up, retrieval, delivery to third parties, and/or, disposal of said biological samples or other specimens.

12. A system as claimed in claims 1 to 11, wherein the management of said system is controllable by one or more users.

10

13. A system as claimed in claim 12, wherein said system includes authentication means to authenticate the authority of said one or more users to manage said system.

14. A system as claimed in claim 13, wherein said authentication means includes the
15 supply of a user name and password, the use of biometric (e.g. fingerprint or iris scan) identification means and/or other authentication means.

15. A system as claimed in claims 13 or 14, wherein varying levels of authentication means are enabled to different users, dependent upon individual access and management
20 authorities.

16. A system as claimed in any one of claims 1 to 15, wherein said system includes validation means for indication to a user of a management instruction.

25 17. A system as claimed in claim 16, wherein said validation means includes the supply of return data or some means of visual indication (such as the greying of a screen) being provided to the user.

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18. A system as claimed in any one of claims 1 to 17, wherein said system includes logging means, to record ongoing data pertaining to each sample/specimen or groups of samples/specimens.

5 19. A system as claimed in claim 18, wherein historical data pertaining to said sample/specimen or groups of samples/specimens is retrievable from said logging means.

20. A system as claimed in any one of claims 1 to 19, wherein said system further includes analysing means to analyse data pertaining to a sample/specimen or groups of
10 samples/specimens, produce reports thereabouts, etc.

21. A system as claimed in any one of claims 1 to 20, wherein said system uses a graphical interface.

15 23. A system as claimed in any one of claims 1 to 21 wherein said system includes replication and queuing means.

23. A system as claimed in any one of claims 1 to 22, wherein said system is used for the management of biological samples or other specimens by academic and/or research
20 institutions, pathology practices, clinical trial purposes, agricultural purposes, etc.

24. A system for the management of stored biological specimens, including:
a repository of biological specimens, each specimen having sample data pertaining thereto;

25 a processor, including:
a database containing profile data correlating to said sample data;
searching means for one or more user to search said database; and
control means, for one or more user to control the management of said specimens, including the retrieval, delivery and disposal of each sample, and, the
30 environmental conditions in which each sample is stored.

25. A system as claimed in claim 24, wherein said processor is accessed by said one or

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more user from a remote location, such as via the Internet.

26. A system as claimed in claims 24 or 25, wherein said processor includes authentication means to authenticate the authority of said one or more users, wherein each
5 said one or more users may have differing authority levels.

27. A system as claimed in any one of claims 24 to 26, wherein said processor further includes identification means to determine the identity of each of said one or more users, wherein said identification means includes the supply of a user name and password, the use
10 of biometric identification means, or other like identification means.

28. A method for managing the storage of biological specimens, including the steps of:
providing a repository of biological specimens, each specimen having been sampled to obtain sample data pertaining thereto;
15 entering profile data, correlating to said sample data of said biological specimens into a database;
managing the identification retrieval, delivery and disposal of each sample, and, the environmental conditions in which each sample is stored via a control means by one or more user.

20 29. A method as claimed in claim 28, wherein said one or more user accesses said database and/or said control means from a remote location via a communications carrier, such as via the Internet.

25 30. A method as claimed in claim 28 or 29, wherein said managing step further includes authenticating the authority of said one or more user, wherein users may have a differing authority level.

31. A method as claimed in any one of claims 28 to 30, wherein said managing step
30 further includes identifying said one or more user, including by the supply of a user name and password, the use of biometric identification means, or other like identification means.

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32. A computer readable medium of instruction for the management of stored biological samples.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01181

A. CLASSIFICATION OF SUBJECT MATTERInt. Cl. ⁷: G06F 19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPAT and JAPIO with: G06F17/-, G06F 19/-, inventory, database, storage, biological

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 2001 43038 A (PPGX, INC) 14 June 2001 Whole description	1-4, 7-23, 32
P, A	WO 2001 69430 A (DNA SCIENCES, INC) 20 September 2001	8-10, 13-15, 17-23
P, A	WO 2001 16858 (REALTIMEHEALTH.COM, INC) 8 March 2001	

☐ Further documents are listed in the continuation of Box C
 ☐ See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

3 January 2002

Date of mailing of the international search report

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